

# Farm Capital Outlays and Stock

**T**HE drop in farm income of the past year has raised questions concerning the prospects for farm investment, a particularly volatile category of farmers' expenditures. Farm outlays for plant and equipment account for almost one-eighth of total private fixed investment, and are thus of interest in consideration of the general business picture. Estimates of past farm investment and of stocks and discards of farm capital goods are used in this article to appraise trends in net growth and replacement of farm capital and relationships between farm investment and other economic series.

## Summary

In the period 1949-52, farm fixed capital outlays, which averaged \$3½ billion a year, were high by historical comparison. They were well above the volume of real investment estimated to be necessary to provide for the normal growth and replacement of farm capital stocks. This strength of investment stemmed from backlogs of capital demand deferred during and immediately following World War II. Since 1948 the availability of equipment, together with high farm income and other favorable economic factors, made possible the gradual elimination of the backlogs.

From 1948 to 1952, farm capital outlays were higher than in the past in relation to the net cash income of farm operators, and farm income itself was relatively high, as indicated by the price parity ratio. Other economic factors also favored investment—a generally tight farm labor market, and favorable credit terms.

During the past year, however, declines in farm capital outlays have been substantial, reflecting not only reduced farm income, but also a readjustment to a more normal rate of growth and replacement of capital stocks. Once the readjustment is completed, long-run considerations suggest that capital outlays will proceed at a rate that is not greatly different from the rate of the first half of 1953, assuming the national economy continues to expand. By the latter part of this decade, farm investment is due again to increase substantially as demand for replacement of the large volume of farm machinery items purchased in the postwar period begins to assert itself.

## Estimates of farm capital outlays

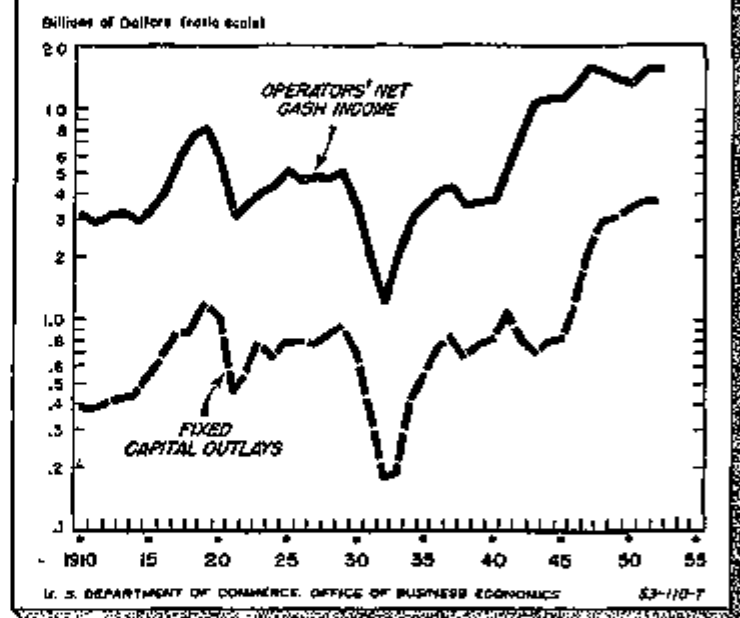
Table 1 presents estimates of farm capital outlays in current and constant (1947) dollars. The table is confined to fixed productive investment, since it is this type of investment to which the subsequent analysis is addressed. Farm residential construction and the change in farm inventories are not shown.

The estimates of farm machinery and equipment, and farm tractors, are components of revised estimates by the Office of Business Economics of producers' durable equipment, heretofore unpublished.<sup>1</sup> Those of farm purchases of trucks and automobiles for business use are unpublished estimates of

the Bureau of Agricultural Economics. These series are combined to obtain farm producers' durable equipment. The new farm nonresidential construction series is the regularly published national product component.

One important element of farm investment in the past is not included in table 1, which was set up in conformity with the gross national product framework. That is the gross

Farm capital outlays move closely with farm operators' net cash income



investment in horses and mules. The value of the net change in numbers of workstock—net investment—is included in the conventional estimates of changes in farm inventories. Not included is replacement of workstock which when added to the net change in stock gives the gross investment. This gross investment has been estimated for the purposes of this analysis as the market value of horse and mule colts, purchased or raised for use as workstock.

Exclusion of gross investment in workstock in historical analyses of farm investment may yield misleading results. Such investment amounted to more than \$200 million annually from 1910 to 1918, thereafter gradually declining to less than \$10 million in the past several years. Thus, investment in workstock was a substantial proportion of farm investment in the early years, gradually declining in relative importance as workstock was progressively displaced by tractors and motor vehicles. If this factor is ignored, an upward trend in the relationship of farm fixed investment to farm income develops. Also, if workstock is excluded from estimates of stocks of farm fixed capital, a greater upward trend appears than if it is included. Unless otherwise indicated, farm fixed

See footnotes at end of article.

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investment in the subsequent discussion includes gross investment in workstock.

### *Farm fixed investment one-eighth of total*

Over the period 1910-52, farm fixed investment has averaged 13 percent of total fixed productive investment in the economy, exclusive of residential construction. Over the same 43 years, the gross national product originating in farming has averaged less than 11 percent of total private gross national product.<sup>2</sup> Thus, the ratio of outlays for plant and equipment to gross product has been greater in the farm economy than in the private nonfarm sector—10 percent as compared with 8½ percent.

Farm investment as a proportion of total private investment has tended to decrease over time. Farm capital outlays averaged almost 18 percent of the total from 1910 to 1919; 12 percent in the 1920's; and 11 percent in recent years. This movement reflects the fact that gross national farm product is becoming a smaller proportion of total private product, declining from 16 percent in 1910-19 to about 8 percent in recent years as a result of the smaller rate of growth in real farm product than in the total. The downward trend in farm investment relative to total investment has been obscured since World War II because postwar farm investment was high relative to farm income and product.

### *Economic Influences*

Farm investment in machinery and new nonresidential structures has fluctuated widely over the period 1910-52, as shown by the accompanying chart. The drops have been substantial in periods of economic depression. Real farm investment fell by one-half from 1920 to 1921, by three-fourths from 1929 to 1933, and by one-third from 1937 to 1938. Declines in terms of current dollars have generally been even greater.

Recovery periods have carried real farm capital outlays higher than in the preceding period of prosperity. Over time there has been an upward trend in real farm investment averaging almost 2 percent a year. The broad trends in real farm investment will be analyzed later, in terms of changes in capital stocks. This section is concerned with the economic influences that determine the movements in farm investment.

Of the economic influences, the most important is farm income. The net income of farm operators reflects the rate of return on farm capital, is the chief source of funds out of which outlays for fixed capital are made, and influences the expectations of farmers as to future rates of return and income. Wage rates of farm labor, the prices of capital goods, and their relative movements bear on the profitability of substituting capital for labor. Interest rates, which affect the cost and prospective net return of capital, and the willingness of financial institutions to meet farmers' demands for capital, are important determinants of the use of credit in investment activity.

Technological advance is a fundamental factor affecting the prospective return on new investment, and the rate of substitution of new capital for old capital and for other inputs, but it is not subject to quantitative appraisal. However, technology may advance fairly steadily over time in a progressive economy, although the rate at which new equipment is adopted is influenced by economic conditions.

### *Farm investment a stable fraction of income*

Farm income is the net result of the various supply, demand, and price factors affecting the farm economy.

Specifically, it reflects the interaction of farm output, prices received by farmers, the volume of input factors, and the prices paid by farmers for the inputs.

Of the several available farm income concepts and measures, the one most closely related to farm investment has proved to be the Bureau of Agricultural Economics series, net cash income of farm operators from farming before outlays for capital goods. This series excludes nonmonetary income, and represents cash receipts from farm marketings and government payments, after deduction of the various production expenses other than depreciation. The series thus includes both the return on capital and compensation for the labor of the farm operators.

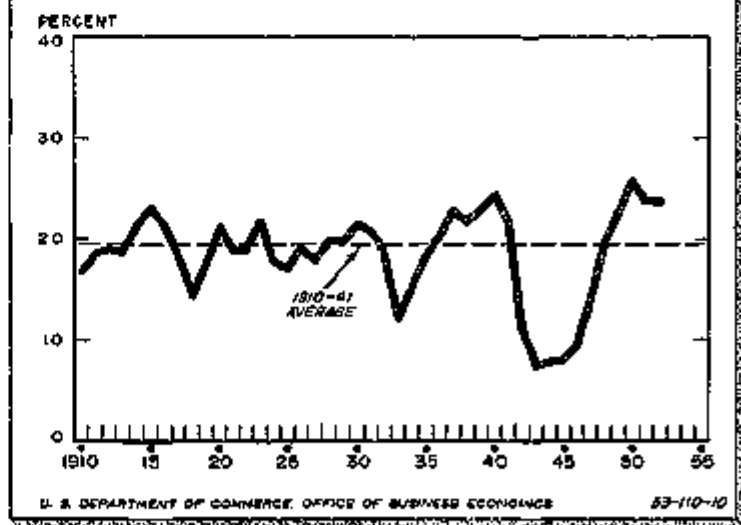
Over the period 1910-41, farm capital outlays, including investment in workstock, were a relatively constant proportion of net cash income, averaging 19½ percent. There is some evidence of a slight upward trend in the ratio. In years of declining income, the ratio tends to be slightly lower. In 1933, the ratio dropped substantially as investment lagged income on the upturn. The ratio also dropped in both World Wars as a result of limitations placed on civilian output.

The ratio for the 4-year period 1949-52 has averaged about 24 percent. This is significantly above the ratio for the 1910-41 period, even if allowance is made for an upward time trend.

### *Farm investment more volatile than income*

The relationship between cash farm income and investment can be defined more precisely in terms of correlation analysis. The degree of correlation between the two variables over the period 1910-41 is quite high.<sup>3</sup> The regression equation indicates that a 10 percent change in

Farm fixed capital outlays have been, with some exceptions, a relatively stable proportion of net cash farm income



net cash income is associated with a 10.8 percent change in investment. Thus, farm investment is slightly more volatile than net cash income, and constitutes a slightly smaller proportion of income when income is low than when it is high. At present levels, a \$1 billion decline in farm income is associated with a \$240 million drop in investment. Since

<sup>2</sup> See footnotes at end of article.

Table 1.—Farm Producers' Fixed Investment

	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952
Millions of Dollars																								
Nonresidential construction.....	180	87	38	13	20	30	85	85	207	02	108	06	128	125	183	175	167	467	714	806	796	873	875	869
Producers' durable equipment.....	821	635	358	191	186	383	531	688	797	518	677	763	1,016	716	881	640	702	776	1,469	2,188	2,378	2,510	2,787	2,803
Total.....	961	721	396	204	206	413	616	773	904	530	785	848	1,143	841	783	824	869	1,223	2,183	3,174	3,169	3,291	3,572	3,733
Millions of Constant (1947) Dollars																								
Nonresidential construction.....	300	168	85	33	51	68	148	191	220	200	333	207	251	217	252	247	222	538	714	737	740	766	715	734
Producers' durable equipment.....	1,110	863	504	284	300	632	840	1,062	1,202	876	1,028	1,125	1,450	978	858	834	893	870	1,469	1,634	1,694	2,096	2,160	2,136
Total.....	1,410	1,025	589	317	350	701	987	1,253	1,421	1,076	1,361	1,332	1,701	1,195	1,110	1,081	1,115	1,418	2,183	2,571	2,734	2,867	2,865	2,869
Index Numbers, 1947=100																								
Implicit price deflator for total.....	60.4	70.3	67.2	64.4	58.1	59.8	59.8	60.4	63.2	60.0	62.1	63.5	67.2	70.5	67.8	76.2	77.0	88.2	100.0	111.3	115.0	117.9	128.2	129.5

investment in workstock is now negligible, almost all the change in investment computed currently would represent mechanical equipment and new construction.

Changes in farm investment are greater relative to changes in gross farm income, or cash receipts from farm marketings, than in relation to net farm income. This follows from the fact that net farm income is more volatile than cash receipts because production expenses are relatively more stable than receipts. The input items charged to current production expense do not fluctuate greatly since production itself is comparatively stable from year to year. The flow of services from capital is likewise not volatile, but small changes in the flow of capital services may be associated with large changes in outlays for new capital.

The regression equation indicates that actual farm investment from 1949 to 1952 was well above computed levels, the deviation in 1952 amounting to about 10 percent. While this result is within the margin of error of the calculation, it is reinforced by the ratio analysis, and is also in line with the results of the stock trend approach in the next section.

It is interesting to note that if farm fixed investment exclusive of gross investment in workstock is related to income, a pronounced upward trend appears, which merely reflects the progressive substitution of tractors and motor vehicles for horses and mules. A similar result appears when new nonresidential construction and machinery purchases are related separately to income. Construction has been declining relative to income, while machinery sales show an upward trend. Thus, it is much more satisfactory to deal with aggregate capital outlays in relationship to income. Trends in individual types of equipment will be analyzed later in terms of stocks.

Since farm investment is affected by economic factors other than those comprised by farm income, other relevant variables were tested in the correlation, but did not improve it significantly. This is due to the intercorrelation of some of the other factors with farm income, which makes it impossible to segregate their separate effects.

### Recent declines in farm income

In the first half of 1953, cash receipts from farm marketings, seasonally adjusted at annual rates, were about 6 percent below 1952 receipts. This implies a drop in net cash income of farm operators in excess of 10 percent, since production expenses have not declined nearly so much as cash receipts.

Farm outlays for plant and equipment in the first half of 1953, seasonally adjusted at annual rates, have also declined by at least 10 percent from the 1952 total, according to preliminary estimates. The drop may prove to be closer to 15 percent, if farmers have returned to a seasonal pattern pre-

vailing before the war, when they purchased a larger proportion of equipment in the first half of the year than has been the case since the war.

Thus, the close relationship between net cash farm income and farm fixed investment appears to be continuing at present, although a final judgment must await complete data for 1953.

### Farm wage rates up relative to machinery prices

Farm wage rates have increased 5-fold between 1910 and 1952. Prices of farm fixed capital have increased 2½ times over the same period. This doubling of the price ratio of farm labor to plant and equipment prices has been an important influence in the gradual substitution of capital for labor reflected in the doubling of capital stocks relative to output while labor input has declined. To some extent, however, the increase in capital per worker has been a cause of the increase in farm productivity and thus in wage rates. And since real farm income has also approximately doubled over the period, it is impossible quantitatively to segregate this influence from that of the rising ratio of wage rates to machinery prices.

Over the short run, farm wage rates have a considerable amplitude of fluctuation, varying with farm income, although not to the same degree. Farm machinery prices, on the other hand, are still less flexible, so that the price ratio also varies positively with farm income. Again, it is not feasible clearly to disentangle the effects of the two factors, but the changing price ratio tends to reinforce the effects of changing income on investment.

With regard to machinery prices, it should be noted that the price indexes generally take account of changes in quality, or efficiency, of the machinery only insofar as such changes are associated with cost changes. Since farm machinery and equipment have been continuously improved during the period, this, in effect, amounts to an upward bias in the price index. Thus, the secular movement of relative prices of farm labor and capital has been even more favorable than computations reveal.

It is believed that in the farm economy, capital is less competitive with the other inputs than with labor. Some of the purchased intermediate products are complementary with capital, such as expenditures for gasoline, oil, and repair of motor vehicles. Other intermediate products, such as fertilizer, insecticides, and commercial seeds, are a product of the same technological advance that promoted capital outlays, and frequently require capital goods for their application. In any case, real purchases of intermediate products have increased even more rapidly than capital.

Over the long run, there appears to have been some substitution of capital for land, since capital stocks per acre

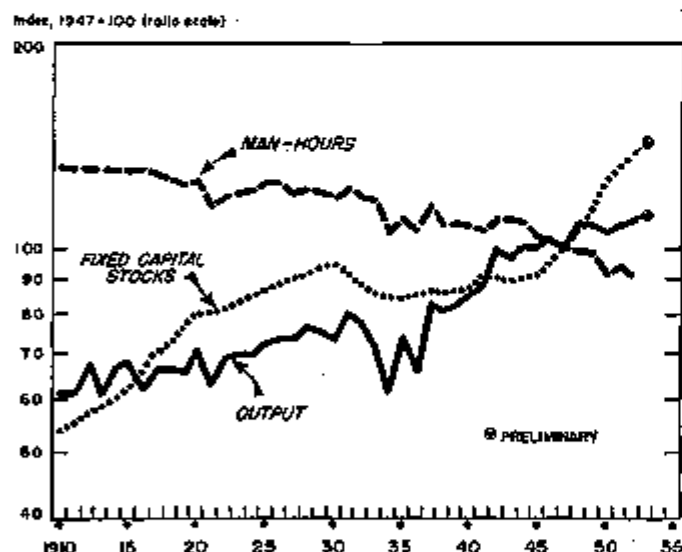
have increased substantially. This has been associated with a greater secular increase in land rents than in machinery prices. But the capital factor has been only one of a variety of improved agricultural practices that have increased land yields, so too much stress should not be laid on relative prices in this connection. And here again, relative prices are intercorrelated with farm income, since land rents vary directly with prices received and farm income.

### Financial factors favorable

Average interest rates charged to farmers have declined rather steadily since 1910, with small reversals in the early 1920's, and from 1946 to the present. The secular decline in short-term loan rates, which are more important for equipment purchases, has been greater than the decline in farm mortgage interest rates.

It is possible that this has been a factor in stimulating farm investment. However, the farm debt in 1952 of around \$14 billion was actually lower than it was in 1921, despite the higher price level today. As a ratio to net cash farm income, farm debt was about 0.75 in 1952, compared with around 3.0 in the 1920's.

**Stocks of fixed farm capital have generally increased, while farm man-hours have declined, relative to farm output**



Farm debt declined fairly steadily from 1921 until the end of the war. Since 1946, however, non-real-estate debt rose by almost \$5 billion, while mortgage debt rose about half as much. While some of the proceeds of the increasing volume of loans has financed capital outlays, it has not been a large percent of investment. Furthermore, it is questionable whether the interest rate has been a significant factor in the farmers' postwar demand for credit to finance capital purchases.

It is of interest that liquid assets of farmers, which had risen by almost \$10 billion during the war, rose by an additional \$2 billion between 1946 and 1952, despite the large increase in capital outlays.

In general, the favorable financial position of farmers in the postwar period probably served to augment investment activity. The large liquid assets of some farmers will help

to cushion the effect of the recent declines in farm income, and greater recourse may be had to credit to help finance capital outlays. But the broad movements in capital outlays will probably continue to be tied predominantly to shifts in net cash farm income.

### The Stock of Farm Capital

The gross stock of fixed capital can be thought of as a cumulative total of the annual outlays for fixed capital goods less the total of discards from previous years' purchases. When capital outlays are expressed in terms of a fixed set of prices, the derived discard and stock estimates are likewise in constant prices and reflect changes in physical volume. This is the concept underlying the measurements discussed in the June 1953 SURVEY OF CURRENT BUSINESS. Essentially the same method has been used to compute the stock of farm fixed capital for this article, except that instead of the assumption that equipment is scrapped after its average life, discards were distributed about the average life in accordance with available survival, or scrappage, tables. Also, the stock estimates were carried back to 1910 so that the long-run trends could be distinguished. (See chart.)

Two main points should be kept in mind in interpreting capital estimates. First, they represent a physical stock, in terms of what the various items would have cost to build in the base year, 1947. They do not fully reflect changes in the productive efficiency of the machines. One study estimates that, over a 20-year period, the quality of new farm machines has increased at an average annual rate of about 2½ percent a year.\* But such estimates can only be rough, in view of the complexity of the factors involved. In any case, in considering capital as an input factor, it seems desirable to measure it net of efficiency changes.

Secondly, a constant scrappage curve has been used, whereas in reality, scrappage and replacement may be deferred, or speeded up. In comparing computed stocks with estimates of numbers of machines on hand—which can be done in the case of tractors and trucks—computed stocks declined relative to actual numbers during the 1930-34 period, and again during World War II. By 1952-53, however, stocks and numbers had shown approximately the same growth over the period studied, and the average age of equipment was generally back to prewar levels. This indicates that stock estimates, despite their approximate nature, are useful for analysis of long-term trends of net capital growth.

### The stock approach to secular demand analysis

Since capital stock represents a cumulative total of the real net investment of the past, its movement reflects the net result on investment of fluctuating year-to-year economic forces. The secular trend in total stocks is a result of trends in net investment, and may be expressed in terms of a rate of growth of stock.

The net growth in capital stocks is composed of two main elements. One is the percent increase in capital corresponding to the percent increase in output, necessary to maintain the previous ratio of capital to output, or "capital coefficient." This element is sometimes referred to as the widening of capital. The rate of growth of capital over and above the rate of growth of output results in a rising capital coefficient, or a deepening of capital. This trend is indicative of a progressive substitution of capital for other inputs, although replacement and widening of capital by means of improved capital goods can also reduce unit requirements for other inputs.

Discards of capital, and the associated replacement demand, are a function of past capital outlays and the rates of retirement of the various types of capital.<sup>5</sup>

Analysis of net growth and replacement is a fruitful basis for projection of future investment trends, assuming the same net influence of relevant economic factors and interrelationships as in the past. The past rate of net growth of stocks, as modified by any special foreseeable factors, is a guide for projecting net additions to capital. Over the near term, discards and replacement demand are heavily influenced by past capital outlays. Discards in the more distant future can be calculated by adding projected net investment to the discards of each year, and entering the consequent gross investment into the discard table, so that its influence in years further into the future can be taken into account. It must be emphasized that such projections are not forecasts, but are "norms" about which net and gross investment will fluctuate depending on the short-term play of market forces.

### The growth of total farm capital stocks

The physical volume of plant and equipment in the farm economy exclusive of workstock has increased roughly threefold between 1910 and 1952, an average annual rate of almost 2½ percent. The growth is somewhat less if work animals are included, but is still impressive.

Over the same period, the physical volume of farm output increased at an average annual rate of close to 1½ percent. Thus, on net balance, in agriculture the capital coefficient has been rising at an average rate of around 1 percent a year. The progressive substitution of capital for labor implied by this trend is clearly evident in the chart. The decline in man-hour requirements per unit of output has averaged 2.3 percent a year.

Table 2 shows that the increase in plant and equipment was considerably greater between 1910 and 1930 than between 1930 and 1952. During the earlier period, the net growth was higher from 1910 to 1920, when tractors and motor vehicles were being introduced at the most rapid rate, than from 1920 to 1930. In fact, the 1920-30 rate of increase was almost 2 percent—approximately the same rate as prevailed between 1930 and 1952. The fact that farm capital stocks at the end of 1952 were approximately on the trend line extrapolated from 1920 to 1930 lends some support to the judgment that by 1952 stocks of capital were approximately in line with output, and that the average rate of growth in the future is more likely to be in line with past trends than at the rapid rate of the last five years when backlogs of deferred demand carried over from the depression and war were being made up.

In this connection, the more than 50 percent increase in total stocks indicated by the table for the period 1930-52 actually took place largely after 1946. Total stocks declined a bit during the depression as gross purchases fell below normal replacement requirements, but by 1941 were back to the 1930 level. Little change occurred during the war, as farmers were allocated sufficient machinery for replacement purposes, and stocks at the end of 1945 were approximately the same as in 1941. Thus, the 1946-52 purchases were considerably higher than required for the secular growth of stock. The decline in farm capital outlays since mid-1952, associated with a decline in farm income, also represents a readjustment to a more "normal" rate of growth of capital stocks. The two factors are, of course, connected, since the decline in income reflects to some extent the rapid buildup in output capacity stimulated in part by the large export demand which has recently receded.

### Trends in discards

Discards of machinery are highest in the several years around the average retirement age of the various items.

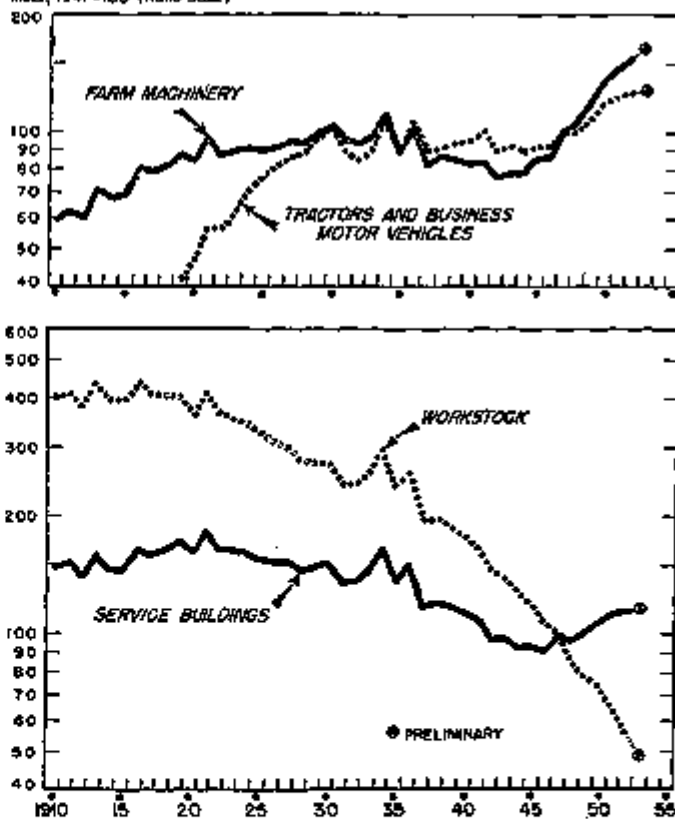
Thus, discards reflect, or "echo" the purchases of relevant previous years.

Total discards, and associated replacement demand, increased fairly steadily from 1910 up to approximately the beginning of World War II, almost quadrupling over the 30-year period. This reflected the upward trend of machinery purchases from around the turn of the century until 1929, and of new construction since even earlier. Due to the drop in capital outlays during the depression, calculated discards declined somewhat during World War II, but then rose in the postwar period.

Actual discards undoubtedly rose much more than computed discards from 1948 on, as deferred replacement was made up. This is indicated by the 1950 Census of Agriculture, which shows that whereas the average age of farm machinery and vehicles had increased between 1940 and 1945, by 1950 it was on the way back toward the 1940 average. Thus, the more normal rate of discards, used in the discard computations, can be expected to reassert itself—especially in view of the high farm investment since Korea, which was in part an effort of farmers to get their equipment in good shape in case of prolonged outbacks in production of machinery and building materials.

The ratio of capital stocks to output in farming has varied according to type of capital

Index, 1947 = 100 (Ratio Scale)



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At the present time calculated discards are tending to level off, reflecting the leveling of capital outlays during the war. Since farm investment was held down from 1942 to 1946, replacement demand is unlikely to rise significantly again until the latter part of the decade. But an analysis



of the outlook can better be undertaken after trends in the individual major types of farm capital have been examined separately.

### Tractors

Farm tractors (exclusive of steam tractors), which were just being introduced in 1910, increased rapidly to number a quarter of a million in 1920, close to a million in 1930, and more than 4 million at the beginning of 1953. The growth has reflected progressive improvement in tractor types, involving introduction of a successful general purpose type of tractor in the 1920's, the power takeoff for mechanical operation of attached equipment, rubber tires in the 1930's, and other technical improvements that have progressively increased efficiency.

A curvilinear trend fitted to numbers of tractors other than garden types indicates a rate of growth of around 5 percent at the present time, or somewhat more than 200,000 tractors a year. A declining rate of increase of the trend is expected to continue during the rest of the decade, although the average net purchases will not change greatly.

One factor is that the number of farms likely to adopt tractor power in the foreseeable future is limited. The 1950 Census of Agriculture revealed that 2.5 out of a total number of 5.4 million farms were mechanized. Of the 2.9 million farms without tractors, 1½ million had no horses and mules, were mostly small farms with low production, and can be largely eliminated from the potential market. About 1.1 million farms had two or more horses and mules, and, except where terrain prohibits, may be considered a prime market. A few of the one-half million farms with only one horse or mule might also represent prospective purchasers. Looked at from another angle, of the farms without tractors, only 1.3 million comprise more than 50 acres.

If 3.5 million farms should possess tractors by 1960 this would represent a smaller rate of increase in mechanized farms in this decade than occurred during the 1940's. But as the limit to the extensive market is approached, it is probable that sales to farmers still without tractors will be progressively harder to make.

A factor of greater relative importance in recent years is the increasing number of tractors per mechanized farm. This ratio increased from 1.11 in 1940 to 1.36 in 1950, or more than 2 percent a year. The increasing size of farms and the increasing amount and variety of auxiliary equipment point to a continuation of the trend.

These two factors together point to a decline in the rate of growth in total tractor stocks to around 3½ percent by 1960, which would correspond to an absolute net increase in stock averaging about 200,000 a year for the period.

The discard computations indicate that replacement demand will rise from around 200,000 at present to approach 300,000 a year by the end of the decade. Most of the calculated increase takes place after 1958, when the large number of postwar purchases will begin to wear out or become obsolete, based on the 1941 survival curves.

### Business motor vehicles

Trucks and automobiles have greatly speeded up the farm transportation job, and made available markets that were inaccessible with team and buggy. Numbers of trucks on farms increased almost as rapidly as tractors up to 1930, when 0.9 million were in use. But by the end of 1940 the number had reached only 1.1 million. Thereafter, the increase was quite steady and by the beginning of 1953 there were 2.5 million trucks on farms.

It seems quite possible that a rate of increase close to the more than 4 percent a year that prevailed from 1930 to 1952 can continue for some years. In 1950, only 1.8 million farms

were equipped with trucks, which suggests that the potential extensive market is less saturated than in the case of tractors. As to the intensive market, the number of trucks per farm reporting one or more trucks has increased slowly, the rate of growth amounting to almost one percent a year between 1940 and 1950.

In line with the tendency of truck numbers to increase at a decreasing rate up to 1930, however, additions will probably not exceed 100,000 for the rest of the decade. This implies a smaller decline in the rate of increase than in the case of tractors.

Total truck sales may be expected to increase, however, since discards will rise from over 200,000 computed for the current year to around 300,000 by the end of the decade. The potential replacement market will continue to rise throughout, since farmers were permitted relatively high truck purchases during the war.

Automobiles on farms, partly due to their predominantly personal use, became an important factor earlier than trucks. By 1920 there were almost 2½ million cars on farms, and by 1930 more than 4 million. Since 1930, stocks have grown but slightly—to 4.3 million by 1940, and 4.4 million at the beginning of this year. The prospect is for little change in numbers of automobiles. With a downward trend in the numbers of farm families, this means a slow increase in the proportion owning automobiles, which is consistent with a gradual rise in real income.

Table 2.—Farm Capital Stocks in Constant (1947) Dollars

	Index numbers, 1930=100			Average annual percent changes		
	1910	1930	1952	1910-1932	1910-1950	1930-1952
Total stock of fixed capital	53	100	154	3.6	3.2	2.0
Total including workstock	57	100	147	2.3	2.8	1.8
Service buildings	61	100	113	0.8	1.0	0.0
Farm machinery and power	22	100	168	4.2	5.8	3.8
Machinery	47	100	224	3.8	3.8	3.7
Power	24	100	101	4.7	7.5	2.2
Horses and mules	124	100	31	-3.3	-1.1	-5.2
Tractors, trucks, autos	1	100	100	-----	-----	2.9

Thus, the market for automobiles in farm areas is a replacement market. It is estimated that it is upwards of 0.4 million at present. This number is expected to decline during the mid-1950's, reflecting small wartime purchases. By 1960, the farm automobile replacement market will be rising, but still below recent levels.

### Workstock

Since World War I, the numbers of horses and mules on farms have declined every year. From a peak of almost 27 million at the beginning of 1918, the number has dropped to less than 6 million in early 1953 as tractors and motor vehicles progressively displaced the work animals.

The curtailment in workstock has largely been affected by restricting the birth of colts, which is now down to a very low level. If the recent numbers of new colts produced per year is extrapolated, and deaths computed by applying mortality curves to previous years' births, it is estimated that total numbers of workstock will be below 3 million in 1960. This implies somewhat smaller absolute declines in the future than the 0.6 million average of the past 35 years. During the following decade, the process that has resulted in shifting

millions of acres of land to production for human consumption from production of farm capital will be brought to completion.

### *Farm machinery*

Due to the wide variety of farm machinery and equipment, capital stocks in this category are discussed in terms of constant dollars. The technological revolution in farming which began more than a century ago at the time of McCormick has continued with the gradual extension of automatic machinery to the various phases and types of farming, progressive improvements in machinery models, and the replacement of most of the older horse-drawn machines with machinery adapted to integral use with tractor power. Some new types of machines have been devised for operations not previously mechanized. Recent examples are cotton pickers, forage harvesters, and pickup balers, sales of which increased rapidly since the war. The bulk of the market for farm machinery, however, is for replacement and for expansion—onto farms in the process of mechanization, and to accommodate increased output on already mechanized farms.

The long-term trend of stocks of farm machinery has been remarkably stable. From 1910 to 1930, stocks increased at an average annual rate of 3.8 percent. Between 1930 and 1952, the rate of growth was 3.7 percent. In the latter period, almost half the increase was to accommodate expanding output, while the rest represented an increase in the capital coefficient.

It seems likely that something close to the past rates of growth will continue for sometime to come. It should be noted that the average rate of growth is significantly less than that in the past few years, when deferred demand was strong. Once the adjustment to a more normal rate of purchases is made, however, farm machinery sales may be expected to increase for the rest of the decade. This will be due chiefly to a steady and accelerating increase in replacement demand. By the final years of the decade, total estimated normal purchases rise by more than \$50 million a year, in terms of 1947 prices.

### *Farm nonresidential structures*

Farmers increased the physical volume of service buildings and other nonresidential construction both absolutely and relative to output from 1910 to 1920. While the volume of service buildings remained fairly constant in the 1920's, it declined slightly relative to output, as shown by the chart. From 1930 to 1945 the decline was more pronounced. The stock of service buildings has been built up to a new peak in early 1953, and although the capital coefficient has also increased, it is still below the ratio of the 1920's.

This movement can be explained by two chief factors. In the first place, the ratio to output of the numbers of equipment items plus workstock which had increased up to 1918, declined somewhat during the 1920's and even more from 1930 to 1946. Thus, the requirements for barns, garages, and other buildings to shelter the workstock and equipment declined. Since 1946, however, the increase in machinery numbers has more than offset the continued drop in numbers of horses and mules, relative to output.

A second factor was the depressed levels of farm income in the 1930's. Under these circumstances, farmers tended to confine their capital outlays to those promising the largest immediate payoff, which were generally equipment items. Some types of service buildings could be adapted to new uses, and replacement deferred. With higher incomes after the war, there was more incentive to make up the deferred replacements, and provide for the necessary additions to plant. This has been accentuated by an increasing tendency among farmers to take better care of their equipment.

If the projected increase in farm output and in the number of farm machinery items is used in extrapolating net growth of service buildings, the prospective increases may be expected to fall from the postwar rates to around 2 percent a year, or \$0.3 billion in 1947 prices. Computed normal replacements average somewhat less than this amount, and remain relatively constant throughout the decade, since it is the buildings of some decades back that are being replaced or supplanted. This projection is particularly tenuous, however, since pressures on income may result in new construction once again giving way to equipment purchases, in which obsolescence is a more dynamic factor. It should also be noted that around 40 percent of farm building is done by farm labor, and to this extent represents demand for building materials, but not contract construction services, from the nonfarm economy.

### *Summary of growth and replacement prospects*

Based on the analysis of growth of the major types of farm fixed capital, the estimated normal growth in 1953 would amount to around \$1 billion in 1947 prices. This implies a larger rate of increase in total stocks than during the period 1920-52, chiefly because a higher rate of additions to non-residential structures seems reasonable. The rate of increase in farm equipment is virtually in line with the past trend.

Total replacement demand is estimated to be around 1.2 billion in 1947 dollars. Thus, total normal farm capital demand is computed to be about four-fifths the actual outlays of \$2.87 billion in 1952, in terms of 1947 prices. The present readjustment in the farm economy has already brought investment down within range of the estimated sustainable rate. If the current decline in farm income goes further, the immediate drop could, of course, be greater. The consensus of farmers as to the outlook will also be significant in regard to the short-run movement of fixed investment.

It is of importance that the current readjustments in farm income and investment are taking place while nonfarm income and investment are rising, so that total economic activity remains high. If the nonfarm economy remains at a high level following the current farm adjustments, the subsequent outlook for farm investment is not unfavorable.

The conclusion from the preceding trend analysis is that farm capital outlays will continue at a relatively stable rate for several years, then experience substantial expansion. Assuming high-level business activity, net additions to capital stock will proceed at a relatively constant amount throughout this decade, implying a slow decline in the percentage rate of increase. The volume of discards requiring replacements is also computed to remain relatively stable until about 1957, when it will begin to expand by around \$100 million a year (1947 prices), reflecting the large volume of postwar machinery and equipment purchases reaching scrappage age.

This type of trend analysis is not a forecast, since it is based on the assumption that business conditions remain favorable, and that past economic trends and relationships will prevail in the future. If, for example, technological innovations in farm machinery were speeded up, increasing the obsolescence factor, farm capital outlays might increase more than projected. If trends in farm income relative to nonfarm income became progressively more or less favorable than in the past, investment would be affected accordingly.

### *Technical Footnotes*

1. The estimates of farm producers' fixed investment are an interim series prepared for this analysis. The revised estimates of producers' durable equipment on which they are primarily based are still preliminary and the revisions are not yet incorporated into the gross national product estimates. They are, however, available in processed form from the Office of Business Economics. The estimates shown here incorporate all the agricultural machinery component and the estimated farm portion of the tractor component of the revised producers' durable equipment.

estimates. The farm portion of tractor sales is estimated on the basis of Census Bureau data. Farm purchases of trucks and automobiles for business use are segments of the Bureau of Agricultural Economics estimates of farm capital expenditures as most recently published, but now in process of revision.

The preliminary revised Office of Business Economics producers' durable equipment estimates differ from the previous series and from the present Bureau of Agricultural Economics series in that capital outlays charged to current expense are not included. They also differ from the present Bureau of Agricultural Economics series in that replacement parts are excluded, and in that the markup adjustments applied to manufacturers' sales have differed. It is expected, however, that the revised series of both agencies will be consistent in these regards.

The Office of Business Economics series is not a completely comprehensive measure of farm purchases in that farmers' purchases of several producers' equipment items not classified by the Standard Industrial Classification as agricultural (such as engines) are included in other segments. The Bureau of Agricultural Economics series includes these farm purchases, and is thus the more complete series. Such purchases have amounted to less than 5 percent of the total, however, and it is believed that the series used here gives a reasonably

accurate picture of the movement of farm capital outlays for analytical purposes, pending completion of the revised series of the Bureau of Agricultural Economics.

For present purposes, the estimates of farm machinery and tractor purchases were extrapolated back to 1929 on the basis of data contained in William H. Shaw, *Commodity Output Since 1929*, National Bureau of Economic Research, New York.

5. For estimates of the gross national farm product, and a discussion of the concept, see the September, 1951 *SURVEY OF CURRENT BUSINESS*.

6. The regression equation, fitted to the data for the period 1929-41, exclusive of 1919, is:  $Y = 1.0015 X + .001$ , where  $Y$  = farm fixed productive investment, including gross purchases of workstock, and  $X$  = net cash income of farm operators before capital expenditures; the coefficient of correlation  $r = .95$ . The income series is contained in a publication of the U. S. Department of Agriculture, Bureau of Agricultural Economics: "The Farm Income Situation," August-September 1952, page 43, Table 17, columns 8 plus 4.

7. American Society of Agricultural Engineers, "Report of an Inquiry into Changes in Quality Values of Farm Machines Between 1910-14 and 1932," St. Joseph, Michigan, June, 1933.

8. The average life implicit in the discard schedules for each of the major categories of farm fixed capital is as follows, in terms of number of years: agricultural machinery and equipment, 10; tractors, 14; automobiles, 11; motor trucks, 10; nonresidential structures, 24.

## Review of National Income and Product in the Second Quarter

(Continued from page 6)

tures has represented less than one-fourth of the advance in total final expenditures.

With current operating expenditures now maintained at a fairly uniform level—reflecting the stabilization of the size of the Armed Forces—almost all of the second-quarter rise in national security outlays continued to be concentrated in major procurement items and new construction, including offshore installations. The advances in these categories were mainly in direct Defense Department outlays, although there has been some variation in the flow as between outlays for domestic account and foreign military aid. The latter took a sharp spurt from the fourth to the first quarters, but was down moderately again in the second.

Purchases of goods and services under most of the supplementary national security programs, mainly atomic energy, stockpiling, and foreign economic aid, continued to show little change in the aggregate.

Federal purchases other than for national security purposes were at an annual rate of \$6 billion, down  $\frac{3}{4}$  billion from the first 3 months of the year. Despite this decline, outlays for the first half of 1953 were 15 percent higher than a year ago, primarily because of a sharp rise in farm price-support operations. The persistent drop in agricultural prices resulted in Commodity Credit Corporation outlays at an annual rate of approximately \$1½ billion in the first half of 1953 as compared with outlays only one-tenth as large in the corresponding period of last year.

State and local government expenditures, at an annual rate of \$24½ billion, also registered a small decline from the preceding quarter. This was traceable primarily to the important construction segment of these outlays. Unusual weather conditions appear to have played a large part in this movement. On the one hand, the mild weather permitted higher-than-normal levels of highway and other construction activity during the winter, while on the other, the unusually heavy and protracted rains in April and May interfered with the normal spring pickups.

### The Flow of Income

Personal income, at an annual rate of \$284½ billion in the second quarter, continued the uninterrupted series of quarter-to-quarter rises that have been in progress for the past 4 years. The decline in farm net income, however, limited the rise to \$3 billion (annual rate).

### Rise in private payrolls

The second-quarter rise in wages and salaries exceeded the increase in total personal income. With an advance of \$3½ billion, these reached a rate of \$198 billion annually—

about \$18 billion higher than in the corresponding quarter a year ago. As compared with the previous half year, the second quarter increase was more evenly distributed among the major industrial groups. In the earlier period, the strong pick-ups in heavy industry following last year's steel strike had resulted in a disproportionately large share of the total payroll increase going to manufacturing industries.

Within the manufacturing sector, the largest rise from the first to second quarters occurred in the electrical machinery industry, where payrolls were almost one-fourth higher than a year ago. Other industries in durable goods manufacturing have shown even larger percentage increases since the second quarter of 1952—notably transportation equipment (including automobiles) and primary and fabricated metals. These industries, however, displayed little change from the first to the second quarter of this year.

Payroll increases in the nondurable-goods manufacturing industries were relatively small, as they had been in the preceding quarter. The principal advances were in chemicals, paper, and printing. There was a small decline in food processing, but textile payrolls, which had receded in the opening months of the year, leveled off in the second quarter.

Increases in employment and in average hourly earnings were of about equal importance in the moderate advances in manufacturing payrolls, with the average workweek showing fractional declines from the preceding period. In the latter part of the quarter, wage contract negotiations in some of the durable goods industries—notably steel, automobiles, and electrical machinery—gave rise to further wage-rate increases which will be more fully reflected in third-quarter payrolls.

In the other commodity producing industries, mining and contract construction payrolls exhibited moderate declines while farm wages increased. The latter was mainly attributable to the greater-than-seasonal rise in farm employment during the quarter to make up for delays caused by adverse weather conditions.

In the distributive industries, as well as in the services and finance group, payrolls continued to rise in the spring quarter. The increase in wholesale and retail trade was about the same as in the preceding quarter and mirrored the high levels of consumer spending. Transportation, communications and public utilities also moved upward. Total payrolls in these industries in the first half of 1953 were about 7 percent above a year ago.

Total Government wages and salaries rose moderately to an annual rate of \$33½ billion, with the rise divided about equally between the Federal and the State and local levels. As compared with the second quarter of last year, payrolls in the latter sector were higher by approximately \$1 billion (annual rate), whereas Federal payrolls showed virtually no change.